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CORNING INCORPORATED
SP-TI-3-1
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EXAMINER	
SONG, MATTHEW J	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 11/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/652,013	Applicant(s) LI ET AL.	
	Examiner Matthew J Song	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-23 is/are pending in the application.

4a) Of the above claim(s) 23 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-22 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 8/29/03.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-22, drawn to a process, classified in class 117, subclass 11.

   II. Claim 23, drawn to a product, classified in class 423, subclass 462.

2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process as claimed can be used to make another and materially different product, such as one have a [110] crystallographic orientation, instead of a [100] orientation.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Walter Douglas on 9/17/2004 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-22. Affirmation of this election must be made by applicant in replying to this Office action. Claim 23 is withdrawn

from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-16 and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lo Iacono (US 6,620,347) in view of Applicants Admitted Prior Art (Admission) or Wehrhan et al (WO 01/64975), where Wehrhan et al (US 2003/0089307) is used as an accurate translation.

Lo Iacono teaches a method of forming a single crystal of CaF_2 using the Bridgeman technique (col 3, ln 1-20). Lo Iacono also teaches a mixture comprising CaF_2 is loaded into a crucible and the crucible is placed into a two-zone furnace. The furnace is heated to a

temperature above the melting temperature of the mixture for a sufficiently long time to insure uniformity of the melt, particularly a temperature of about 1450°C for about 2 hours. Lo Iacono also teaches a temperature gradient is then created along the vertical axis of the crucible, where the temperature gradient is between about 1-20°C per centimeter, this reads on applicants' growing a calcium fluoride single crystal by moving the melting through a temperature gradient having an axial gradient in the range of 2-8°C/cm. Lo Iacono also teaches the furnace is then slowly cooled to grow the crystal and after the temperature reaches a temperature below which the crystal is formed, the furnace is slowly cooled to room temperature (col 7, ln 40-67). Lo Iacono also teaches in the Bridgeman crystal growth method, a temperature gradient is formed across the crucible by lowering the crucible out of a hot side of the furnace to a cooler side of the furnace and the crystal is formed as the melt cools (col 6, ln 50-65).

Lo Iacono does not teach using a seed crystal.

In applicants' admitted prior art, Admission teaches a crucible containing CaF_2 feedstock in a hot zone in a two-zone vertical furnace and an oriented seed crystal is mounted in a seed crystal holder at the bottom of the crucible with the upper portion of the seed crystal in contact with the feedstock. Admission also teaches a crystal front conforming to the crystallographic orientation of the seed crystal is created as the temperature of the molten fluoride drops below the melting point. Admission also teaches the need for [111], [110] and [100] oriented CaF_2 single crystals ([0005] and [0006] of the instant specification). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Lo Iacono by using a seed crystal to produce a fluoride crystal with a desirable orientation, as taught by Admission.

In a method of growing oriented monocrystals, Wehrhan et al teaches producing crystals by allowing them to cool with the aid o an axially disposed temperature gradient and using a crucible provided with a downward protruding well which serves to receive a seed crystal of a desired orientation ([0016]-[0021]). Wehrhan et al also teaches it is preferred to promote crystal growth with the aid of a seed crystal and the seed crystal is introduced into the seed crystal well so that the orientation of the seed crystal corresponds to the desired later orientation of the monocrystal ([0037]). Wehrhan et al also teaches at the end of the melting and homogenization of the melt, the seed crystal is melted ([0040]). Wehrhan et al also teaches the optical homogeneity is $1x10^{-6}$, this reads on applicants' inhomogenenity no greater than 1.1 ppm, and a birefringence being less than 1 nm/cm ([0044]).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Lo Iacono by using a seed crystal to produce a fluoride crystal with a desired orientation, as taught by Wehrhan et al.

Referring to claims 2-3, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches growth in any selected orientation along their {h,k,l} axis ('307 [0013]) and specifically [110] and [100] orientations are desirable (Admission pg 2).

Referring to claims 4-5, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches a range of 1-20 °C/cm. Overlapping ranges are held to be obvious (MPEP 2144.05).

Referring to claim 6, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches the seed crystal is carefully melted ('307 [0040]).

Referring to claim 7, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al is silent to the solid-liquid interface between the calcium fluoride crystal and the melt is constrained to be within the temperature gradient zone. However, this is inherent to the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al because the temperature of the first and second zone require the solid-liquid zone between within the temperature gradient zone since the first temperature forms a liquid state and the second temperature is below the melting temperature of raw material.

Referring to claim 8, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches the optical homogeneity is $1x10^{-6}$, this reads on applicants' inhomogenenity no greater than 1.1 ppm, and a birefringence being less than 1 nm/cm ('307 [0044]).

Referring to claims 9-12, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches a hot side of the furnace and a cooler side of the furnace, this reads on applicants' first and second zone in a furnace. Also, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches the furnace is slow cooled to room temperature after the crucible is completely lowered out of the heated zone, this reads on applicants' annealing in the second zone ('347 col 7, ln 1-40).

Referring to claim 12-13, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches cooling to a temperature of 1250°C ('347 col 7, ln 45-67).

Referring to claim 14-16, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches cooling to room temperature at a rate of about 50°C/hr ('347 col 7, ln 40-67).

Referring to claim 19, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al is silent to applying a decreasingly fast cooling profile to the first zone and an increasing layer slow cooling profile to the second zone. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al by controlling the cooling to obtain an annealing temperature after growth of the crystal, as claimed, because the first zone is at a higher temperature than the second zone.

Referring to claim 20-21, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches a lowering rate is between 0.5-2 mm/hr ('347 col 7, ln 20-40), specifically a rate of 1 mm/hr. Overlapping ranges are held to be obvious (MPEP 2144.05).

Referring to claim 22, the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al does not teach a translation speed of the melt as it moves through the temperature gradient zone does not vary by more than approximately 0.1 mm/hr. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al by minimizing variation because holding a process under steady state conditions is well known in the art to be required to produce a uniform product.

7. Claims 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lo Iacono (US 6,620,347) in view of Applicants Admitted Prior Art (Admission) or Wehrhan et al (WO 01/64975), where Wehrhan et al (US 2003/0089307) is used as an accurate translation, as applied to claims 1-16 and 19-22 above, and further in view of Sakuma et al (US 2002/0038625).

The combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al teaches all of the limitations of claim 17, as discussed previously, except the cooling rate is less than or equal to 3°C/hr.

In a method of manufacturing calcium fluoride crystals, Sakuma et al ('625) teaches annealing a single crystal of calcium fluoride at a temperature within a range of 1020-1150°C and lowering the temperature to room temperature at a cooling rate of 2°C/hr (Abstract and [0049]). Sakuma et al also teaches the annealing and cooling results in a single crystal of calcium fluoride with superior optical properties ([0059]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Lo Iacono and Admission or the combination of Lo Iacono and Wehrhan et al with Sakuma et al's annealing and cooling step to improve the optical properties of the calcium fluoride crystal.

Referring to claim 13, Sakuma et al ('625) teaches an annealing temperature of 1020-1150°C, which overlaps the claimed range of 1300-1100°C. Overlapping ranges are held to be obvious (MPEP 2144.05).

Referring to claim 15-16, Sakuma et al ('625) teaches cooling to room temperature, this reads on applicants' range from approximately 300-20°C.

Referring to claim 17-18, Sakuma et al ('625) teaches a cooling rate of 2°C/hr or less, which overlaps the claimed range of 3°C/hr. Overlapping ranges are held to be obvious (MPEP 2144.05).

8. Claims 1, 4-5, 7, 9-12 and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Price (US 2002/0066402) in view of Shiozawa (US 2001/0019453) or Sakuma et al (US 6,377,332)

Price teaches a method of making calcium fluoride crystals comprising a crucible containing a crystal raw material. Price also teaches heating the raw material in a melting chamber to a temperature sufficient to melt the crystal raw material or maintain the crystal raw material in a molten state. Price also teaches a crystal forms in the molten material as the molten material is translated through a temperature gradient ([0038], [0001]-[0002]). Price also teaches a fluidly interconnected crystal growth chambers to provide for crystal growth orientation transfer from one growth chamber to the next, preferably with the crystal growth orientation being a seeded crystal growth orientation with crystal orientation initiated with a seed crystal of the desired orientation ([0039]), this reads on applicants' loading a calcium fluoride feedstock on top of a seed crystal having a specific crystal orientation.

Price does not teach an axial temperature gradient in a range from approximately 2-8°C/cm.

In a method of making a calcium fluoride crystal, Shiozawa teaches a calcium fluoride powder is used in a vertical Bridgman method of crystal growth to form a CaF_2 crystal. Shiozawa also teaches a temperature gradient of 5°C/cm is used and a pull down rate of 1 mm/hr

([0071]-[0076]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Price with Shiozawa's temperature gradient of 5°C/cm because gradient value is conventionally known in the art to be used in the manufacture of CaF_2 crystals.

In a method of forming a calcium fluoride crystal, Sakuma et al teaches a temperature gradient at the time of growth is 7°C/cm (Table 1 and col 10, ln 5-40). Sakuma et al also teaches the temperature gradient needs to be controlled to obtain a calcium fluoride crystal having a high transmission property and durability (col 5, ln 30-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Price with Sakuma et al's temperature gradient because it is conventionally known in the art to be used to growth calcium fluoride crystals.

Referring to claim 7, the combination of Price and Shiozawa or the combination of Price and Sakuma et al is silent to the solid-liquid interface between the calcium fluoride crystal and the melt is constrained to be within the temperature gradient zone. However, this is inherent to the combination of Price and Shiozawa or the combination of Price and Sakuma et al because the temperature of the first and second zone requires the solid-liquid zone between within the temperature gradient zone since the first temperature forms a liquid state and the second temperature is below the melting temperature of raw material.

Referring to claim 9-12, the combination of Price and Shiozawa or the combination of Price and Sakuma et al teaches an melting chamber and an annealing chamber, this reads on applicants' first and second zones in vertical furnace ([0036]).

Referring to claim 19, the combination of Price and Shiozawa or the combination of Price and Sakuma et al is silent to applying a decreasingly fast cooling profile to the first zone and an

increasing layer slow cooling profile to the second zone. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Price and Shiozawa or the combination of Price and Sakuma et al by controlling the cooling to obtain an annealing temperature after growth of the crystal, as claimed, because the first zone is at a higher temperature than the second zone.

Referring to claim 20-21, Price teaches a translation rate of 0.5-5 mm/hr ([0025]). Overlapping ranges are held to be obvious (MPEP 2144.05).

Referring to claim 22, the combination of Price and Shiozawa or the combination of Price and Sakuma et al does not teach a translation speed of the melt as it moves through the temperature gradient zone does not vary by more than approximately 0.1 mm/hr. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Price and Shiozawa or the combination of Price and Sakuma et al by minimizing variation because holding a process under steady state conditions is well known in the art to be required to produce a uniform product.

9. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Price (US 2002/0066402) in view of Shiozawa (US 2001/0019453) or Sakuma et al (US 6,377,332) as applied to claim 1 above, and further in view of Applicants' Admitted Prior Art (Admission).

The combination of Price and Shiozawa or the combination of Price and Sakuma et al teaches of claim 2, as discussed previously, except a seed crystal has a [110] or [100] orientation. The combination of Price and Shiozawa or the combination of Price and Sakuma et al including using a seed crystal of desired orientation.

In applicants' admitted prior art, Admission teaches a crucible containing CaF_2 feedstock in a hot zone in a two-zone vertical furnace and an oriented seed crystal is mounted in a seed crystal holder at the bottom of the crucible with the upper portion of the seed crystal in contact with the feedstock. Admission also teaches a crystal front conforming to the crystallographic orientation of the seed crystal is created as the temperature of the molten fluoride drops below the melting point. Admission also teaches the need for [111], [110] and [100] oriented CaF_2 single crystals ([0005] and [0006] of the instant specification). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Price and Shiozawa or the combination of Price and Sakuma et al by using a seed crystal to produce a fluoride crystal with a desirable orientation, as taught by Admission.

10. Claims 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Price (US 2002/0066402) in view of Shiozawa (US 2001/0019453) or Sakuma et al (US 6,377,332) as applied to claim 1 above, and further in view of Wehrhan et al (WO 01/64975), where Wehrhan et al (US 2003/0089307) is used as an accurate translation.

The combination of Price and Shiozawa or the combination of Price and Sakuma et al teaches all of the limitations of claim 8, as discussed previously, except the claimed properties of the calcium fluoride crystal.

In a method of growing oriented monocrystals, Wehrhan et al teaches producing crystals by allowing them to cool with the aid of an axially disposed temperature gradient and using a crucible provided with a downward protruding well which serves to receive a seed crystal of a desired orientation ([0016]-[0021]). Wehrhan et al also teaches it is preferred to promote crystal

growth with the aid of a seed crystal and the seed crystal is introduced into the seed crystal well so that the orientation of the seed crystal corresponds to the desired later orientation of the monocrystal ([0037]). Wehrhan et al also teaches at the end of the melting and homogenization of the melt, the seed crystal is melted ([0040]). Wehrhan et al also teaches the optical homogeneity is $1x10^{-6}$, this reads on applicants' inhomogenenity no greater than 1.1 ppm, and a birefringence being less than 1 nm/cm ([0044]).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Price and Shiozawa or the combination of Price and Sakuma et al with Wehrhan et al's process for forming a crystal with desirable properties.

Referring to claim 6, Wehrhan et al teaches the seed crystal is melted to grow oriented crystals ('307 [0040]).

11. Claims 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Price (US 2002/0066402) in view of Shiozawa (US 2001/0019453) or Sakuma et al (US 6,377,332) as applied to claim 1 above, and further in view of Sakuma et al (US 2002/0038625).

The combination of Price and Shiozawa or the combination of Price and Sakuma et al ('332) teaches all of the limitations of claim 13, as discussed previously, except the first temperature is in the range of 1300-1100°C.

In a method of manufacturing calcium fluoride crystals, Sakuma et al ('625) teaches annealing a single crystal of calcium fluoride at a temperature within a range of 1020-1150°C and lowering the temperature to room temperature at a cooling rate of 2°C/hr (Abstract and [0049]). Sakuma et al also teaches the annealing and cooling results in a single crystal of calcium

fluoride with superior optical properties ([0059]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Price and Shiozawa or the combination of Price and Sakuma et al ('332) with Sakuma et al's ('625) annealing and cooling step to improve the optical properties of the calcium fluoride crystal.

Referring to claim 13, the combination of Price, Shiozawa and Sakuma et al ('625) or the combination of Price, Sakuma et al ('332) and Sakuma et al ('625) teaches an annealing temperature of 1020-1150°C, which overlaps the claimed range of 1300-1100°C. Overlapping ranges are held to be obvious (MPEP 2144.05).

Referring to claim 15-16, the combination of Price, Shiozawa and Sakuma et al ('625) or the combination of Price, Sakuma et al ('332) and Sakuma et al ('625) cooling to room temperature, this reads on applicants' range from approximately 300-20°C.

Referring to claim 17-18, the combination of Price, Shiozawa and Sakuma et al ('625) or the combination of Price, Sakuma et al ('332) and Sakuma et al ('625) teaches a cooling rate of 2°C/hr or less, which overlaps the claimed range of 3°C/hr. Overlapping ranges are held to be obvious (MPEP 2144.05).

Double Patenting

12. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground

provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

13. Claims 1-3, 9-14, and 17-18 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,736,893 in view of Applicants' Admitted Prior Art (Admission). US 6,736,893 claims a process for growing calcium fluoride crystal by continuous transfer from a crystallization zone into an annealing zone comprising a temperature gradient of 8-12°C/cm. US 6,736,893 also claims the annealing zone is held at a temperature of 1100-1300°C and cooled at a rate of 2-4°C/hr.

US 6,736,893 does not claim using a seed crystal, wherein a growth direction of the calcium fluoride crystal conforms to the crystallographic orientation of the seed crystal.

In applicants' admitted prior art, Admission teaches a crucible containing CaF_2 feedstock in a hot zone in a two-zone vertical furnace and an oriented seed crystal is mounted in a seed crystal holder at the bottom of the crucible with the upper portion of the seed crystal in contact with the feedstock. Admission also teaches a crystal front conforming to the crystallographic orientation of the seed crystal is created as the temperature of the molten fluoride drops below the melting point. Admission also teaches the need for [111], [110] and [100] oriented CaF_2 single crystals ([0005] and [0006] of the instant specification). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify US 6,736,893 by using a seed crystal to produce a fluoride crystal with a desirable orientation, as taught by Admission.

Referring to claim 1, overlapping ranges are held to be obvious (MPEP 2144.05).

14. Claims 1-22 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of copending Application No. 10/757,751 in view of Applicants' Admitted Prior Art (Admission) and Shiozawa (US 2001/0019453).

10/757,751 claims a method of manufacturing a calcium fluoride crystal by heating in a raw material in a melting zone and cooling in a cooling zone and annealing from a first temperature to a final temperature at a constant cooling rate of less than 3°C/hr. 10/757,751 also claims cooling from the melt temperature to the first temperature a decreasing fast cooling profile is applied to the melting zone and an increasing slow cooling profile is applied to the growth/annealing zone to diminish the temperature difference between the two zones. 10/757,751 also claims a single crystal with an average homogeneity of less than about 1.5 ppm and birefringence of less than about 0.4 nm/cm.

10/757,751 does not claim using a seed crystal, wherein a growth direction of the calcium fluoride crystal conforms to the crystallographic orientation of the seed crystal.

In applicants' admitted prior art, Admission teaches a crucible containing CaF_2 feedstock in a hot zone in a two-zone vertical furnace and an oriented seed crystal is mounted in a seed crystal holder at the bottom of the crucible with the upper portion of the seed crystal in contact with the feedstock. Admission also teaches a crystal front conforming to the crystallographic orientation of the seed crystal is created as the temperature of the molten fluoride drops below the melting point. Admission also teaches the need for [111], [110] and [100] oriented CaF_2 single crystals ([0005] and [0006] of the instant specification). It would have been obvious to a

person of ordinary skill in the art at the time of the invention to modify 10/75,751 by using a seed crystal to produce a fluoride crystal with a desirable orientation, as taught by Admission.

The combination of 10/757,751 and Admission does not claim a temperature gradient of 2-8°C/cm.

Shiozawa teaches a temperature gradient of 5°C/cm in a vertical Bridgman method of growing calcium fluoride crystal ([0071]-[0073]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of 10/757,751 and Admission with Shiozawa's temperature gradient because it is a value that is conventionally used in the art to grow calcium fluoride crystals.

This is a provisional obviousness-type double patenting rejection.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER